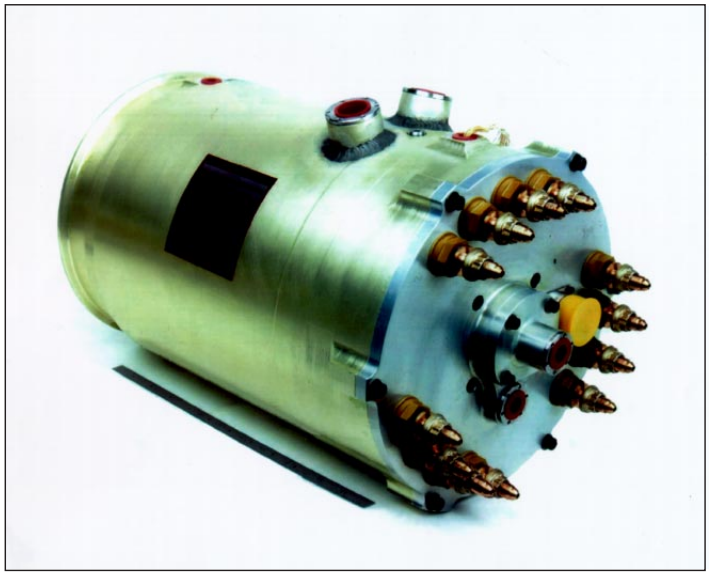
250 Kilowatt Integral Starter/Generator System Provides Fault Tolerant Solution



Payoff

The integration of the electrical starter/generator system into the core of a gas turbine engine will provide both a source for starting the engine as well as providing primary electrical power for the aircraft. The system offers a high temperature, high speed, robust fault tolerant electric machine design that will eliminate the need for complex, high parts count and costly engine and aircraft mounted gearboxes.

Accomplishment

Under a program sponsored by the Propulsion Directorate's Power Division, General Electric and Sundstrand jointly developed a 250 kilowatt (KW) switched reluctance starter/generator (SRSG) system which was selected by the Joint Strike Fighter Integrated Systems Technology Demonstration Program for both ground demonstration and flight test. This program has addressed critical issues required for successful integration of an electrical starter/generator into a gas turbine engine. The SRSG utilizes switched reluctance electric machine technology that offers two independent fault tolerant channels of electrical power from a single generator.

Background

Recent advancements in power electronics and microprocessor- based controls have led to the implementation of the More Electric Initiative, which is replacing conventional aircraft subsystems, traditionally powered hydraulically and pneumatically, with electrical equivalents. This significantly increases the demand on the aircraft's electrical system. Not only does the total electrical load increase, but the demand for fault tolerant electrical power also becomes significant as more electrical loads become flight critical. This led to the development of the 250 KW SRSG which provides a fault tolerant solution. The SRSG is a two-channel system that utilizes the more reliable and fault tolerant benefits of switched reluctance (SR) technology. SR is more reliable than other electric machine technologies because it is brushless and has no windings on its solid rotor. The fault tolerance stems not only from the two-output configuration of the machine, but also from the capability of each output to be operational with faulted phases within the machine or associated electronics.